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TENTATIVE INSPECTION STANDARDS FOR ANTHRACITE MINES

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January 1943.

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

TENTATIVE INSPECTION STANDARDS FOR ANTHRACITE MINES[1/]

CONTENTS

	Page
Introduction	1
Surface Hazards	2
1. General	2
2. Breaker	4
3. Headframe	5
4. Machinery and safety appliances in connection therewith	6
Surface and underground	6
5. Mine-refuse disposal	7
6. Surface haulage	7
7. Hoisting equipment	8
8. Cages and shafts	9
9. Steam plant	10
10. Surface electrical material	11
11. Surface explosives	12
Underground	15
12. General practice	15
13. Ventilation	19
14. Explosives and blasting devices	26
15. Electricity underground	29
16. Haulage	34
17. Timbering	39
Miscellaneous	40
18. Safety organization	40
19. First aid and mine rescue	40
References	41

INTRODUCTION

These tentative inspection standards have been prepared as a guide for the Federal inspection of the anthracite mines of the United States. The Federal Coal Mine Inspection Division is not a mining-law-enforcement

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7231."

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agency, and it is not the intent to advocate noncompliance with State laws. It is recognized that, with change in mining methods and conditions, some of the standards may become inapplicable, and it may be advisable to revise them to meet new conditions.

It is recognized that the most benefit will be derived if the Federal and State agencies and the anthracite industry can coordinate their efforts in seeking remedies to prevent accidents. It is known that some mine managements go beyond the mining laws by adopting safety practices that could well be followed by organizations that have similar accident hazards.

These standards are not laws but are only advisory and for this reason may differ in verbiage as well as in construction from State laws that aim to accomplish the same purpose. Where they are similar in verbiage and coverage, in whole or in part, to the Pennsylvania Anthracite Mining Laws, a reference has been made to the specific provision in the laws. Where they represent suggestions that are not specifically covered by laws but appear to be provisions that are being carried out in instances and should be in others, depending on conditions, no notation is given. Where they do not appear to be specifically covered by laws but are considered by the Bureau of Mines as provisions that would be helpful in the prevention of accidents, an asterisk (*) has been placed before the standard. This does not necessarily indicate thaa the standard is in conflict with the Pennsylvania Anthracite Mining Laws, but rather that it is not specifically provided in the State Mining Laws, or it may exceed the provisions of same.

It is believed that compliance with the standards, where they are applicable, will assist in the prevention of accidents in anthracite mines, regardless as to whether they are covered in whole or in part by the Pennsylvania Anthracite Mining Laws or are given for the reasons stated.

SURFACE HAZARDS

1. General

*1. All buildings within the radius of 100 feet of mine openings should be of fireproof or fire-resistant construction. If existing buildings within 100 feet of mine openings are not of fireproof or fire-resistant construction, fire doors should be erected, if practicable, at effective points so that smoke or fire from outside sources may not endanger men working underground. These doors should be tested for effectiveness at least every 3 months; provided, however, that no "breaker" or other inflammable structure for the preparation or storage of coal should be erected nearer than 200 feet to any such opening (1).2/

2/ Figures in parentheses refer to items in the list of references at the end of this paper.

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2. Adequate fire protection should be provided.

3. Fire-hydrant couplings should be standard and, if feasible, interchangeable with those of municipal fire departments.

4. Fire-fighting equipment should be inspected and tested at least every 6 months and a record made of such inspections.

5. A fire-fighting organization should be maintained and fire drills held at least four times a year.

6. All surface buildings should be well illuminated and heated where necessary.

7. Tight metal receptacles should be provided for oily waste and rags.

8. Roads, paths, and walks should be kept free of obstructions and should be well illuminated if used by the night shifts.

*9. Timber, ties, and other mine lumber, other than 1-day's supply, should be kept a safe distance from the mine opening or mine fan; and all materials, including rails, scrap iron, and other scrap materials should be properly stored and piled so that they will not obstruct roadways, will not present a stumbling hazard, and cannot roll or fall.

10. Electric wiring in all surface buildings should be installed so as not to present a fire or contact hazard.

11. Wash houses should be provided in accordance with State law (2).

12. Supply houses:

(a) Material should be stored so that it will not fall or cause a stumbling hazard.

(b) Oil and grease should be stored in closed containers in a building separate from other materials.

13. Lamp house:

(a) Standard charging equipment should be used.

(b) Naphtha used for flame safety lamps should be stored in suitable containers, and only small amounts, preferably enough for 1 day's use, kept in the lamp house.

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*(c) Only permissible flame safety lamps should be used (3).

*(d) Flame safety lamps should be maintained by a competent person specifically assigned to that duty (3).

*(e) Flame safety lamps should be properly cleaned, assembled, and tested each shift. They should also be tested immediately before being taken underground (3).

(f) Battery-charging equipment should be guarded and protected against shock hazard.

14. In handling railroad cars, brakemen should:

(a) Use a suitable brake stick;

(b) Use a safety belt where practicable;

(c) Use a railroad-type pinch bar for shifting cars; and

(d) Wear snug-fitting clothes.

15. Safety belts should be worn by all workmen engaged in repair work in or around shafts. When a platform is being used, a second or safety platform should be placed not more than 10 feet beneath the working platform.

2. Breaker

1. Electric motors used in breakers should be dust-proof.

2. All switches and starting boxes should be enclosed.

*3. Open stoves or open-type heating devices should be properly safeguarded against fire and contact hazards when used in breakers.

4. Coal dust should be removed thoroughly and frequently from floors and ledges, preferably daily and at least weekly.

5. Breakers having a dust hazard should use a dust-collecting system of the exhaust type with dust-collecting hoods located at the principal source of dust, or dust should be allayed at its source with water or other wetting agent (4).

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6. Where coal is dumped at or near the intake airshaft, provision should be made to prevent the dust from entering the intake air or the main workings.

7. Surface stairways should not be set on an angle of more than 45° with the horizontal.

8. All stairways should be provided with safe handrails and kept in good repair.

9. Enough head clearance should be provided over stairs.

10. Permanent ladders should be properly built and maintained.

11. All floor openings should be properly guarded with toeboards and rails.

12. All passageways and places where men work should be well illuminated.

13. Men working around breakers should wear goggles when exposed to eye hazards, and at dusty operations they should wear suitable approved respirators.

14. Welding in breakers should be done preferably when the plant is idle; in any event, welding should not be done in a dusty atmosphere, and combustible surroundings should be wetted down before and after the welding operation.

3. Headframe

1. A platform with guardrails should be provided at headsheaves (5).

2. The stairway leading to the sheave platform should be provided with handrails (5).

3. Sheaves should be inspected and oiled daily, but this should not be done while they are in motion. The oiler should advise the engineer in person when he has completed oiling the sheaves, and a written report should be made of this inspection (6).

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4. Machinery and Safety Appliances in Connection Therewith

Surface and underground

1. Machinery and belting should be adequately guarded (5).

(a) All exposed gears, sprockets, and couplings with protruding bolts or nuts should be completely guarded (5);

(b) All shafting and shaft ends within 8 feet of the floor or platform level should be completely guarded (5);

(c) All vertical or inclined belts, chains, or rope drives should be suitably guarded to a height of 7 feet from the floor (5).

(d) Horizontal belts or ropes within 7 feet of the floor platform should be guarded (5).

(e) All flywheels should be guarded. Flywheels more than 6 feet high should be guarded to a height of at least 6 feet (5).

(f) All circular and band saws and planes should be adequately guarded (5).

(g) Locomotive pits should be properly guarded and the guard kept in place when the pit is not in use (5).

2. Hand tools should be kept in good condition. The use of mushroom-headed tools and sprung wrenches should be prohibited.

3. Goggles or safety shields should be provided and men should be required to use them when using grinding tools or doing other work where particles are likely to fly.

4. (a) Welders and helpers should be provided with proper welder's shields to protect their eyes.

(b) Electric-welding operations should be properly screened to protect the eyes of other workmen or passers-by.

5. All electric machines should be grounded according to the National Electrical Safety Code.

6. All rheostats and electrical heaters should be adequately spaced away from combustible material or effectively shielded to eliminate fire hazards.

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7. Lighting circuits and stationary machines should have suitable switches or circuit breakers for cutting off the current and should be located where they may be reached without danger of contact with moving parts.

8. All grinding wheels should be equipped with safety washers and substantial retaining hoods.

9. All surface machines should be adequately illuminated.

10. Adequate clearance should be provided at all machine installations, and passageways should be kept clear of stumbling hazards.

5. Mine-Refuse Disposal

1. Waste dumps should be so located with reference to mine openings as to present no fire, gas, or fume hazard in case the dumps are fired spontaneously.

2. Waste dumps should be fenced where there is a possible hazard to persons, especially to children.

3. Mine-waste disposal that presents a fire or slide hazard should be placed so as not to endanger the mine.

6. Surface Haulage

1. The track and roadbed should be maintained in good condition.

2. There should be a clearance on one side of the track of 24 inches or more from the outside of the widest equipment used. If it is not practicable to obtain such clearance at some places, these places should be marked with a warning sign of impaired clearance.

3. Frogs and guardrails should be blocked to prevent persons from catching their feet in them.

4. Track switches should be provided with switch throws, and the bar extending from the track to the switch throw should be installed in such a manner as to eliminate a stumbling hazard.

5. Outside planes or inclines should have:

(a) A positive stopblock at the top (7);

(b) A derail near the top (7); and

(c) A derail near the bottom (7)

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6. A positive derailing device or equivalent positive mechanical device should be provided on all trips on mechanical or gravity planes.

7. Crossings should be guarded while cars are being moved, unless a positive automatic warning signal is installed.

8. Derail devices should be installed on all sidetracks near junctions with the main line.

9. A positive stopblock or derail should be placed on the tracks leading to the surface shaft landings.

7. Hoisting Equipment

1. Hoists should be equipped with brakes able to stop and to hold the fully loaded, unbalanced cage or trip of cars at any point in the shaft or incline. Sole dependence should not be placed upon a friction brake for holding a cage or trip while men are being loaded or unloaded (8).

2. Hoisting engineers, part of whose duties are to hoist and lower men and materials, should be physically fit and should undergo a physical examination at least annually to determine their continued fitness (9, 10).

3. Hoisting equipment should be inspected daily and a record made of each inspection (11).

4. Where men are hoisted or lowered, the hoisting engine should be provided with positive overwind and overspeed devices.

5. An empty cage or trip should be hoisted in any shaft or slope where the engine has been standing idle for one hour or more before men are hoisted or lowered in said shafts or slopes (12).

6. Flanges or horns large enough to prevent the rope from slipping off the drum should be provided and properly attached to the drum (13).

7. All machines used for lowering or hoisting persons in mines should be provided with an indicator to show the position of the cage, car, or gunboat in the shaft or slope (13) and the indicator should be so placed as to be in constant view of the engineer.

8. The rope should make a sufficient number of full laps on the drum when extended to its maximum distance and should make at least one full lap on the drum shaft, and the end should be fastened securely by means of clamps.

*9. The rope should be fastened to its load by a thimble and clamp and bridle chains, or by a spelter-filled socket and bridle chains, or other approved method (14).

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*10. A rope should not be used for hoisting men when inspection indicates a dangerous amount of wear, corrosion, or distortion (11).

11. A record should be kept of all hoisting ropes showing the length of service or tonnage hoisted. The rope should be replaced as soon as there is evidence of undue weakness or other conditions that indicate that the rope may fail (11).

*12. Enough rope should be cut off when the rope is to be resocketed.

13. Ropes, links, chains, and rope sockets should be examined carefully, at least every day they are used, by a competent person and a written report made of such inspections (11).

*14. When men are transported in cars on outside planes or inclines: Special provision should be made in addition to the coupling to insure against accidents should the rope or the coupling of any car break or become detached, or in case the drawbar of a car should break (14).

15. Rollers used on slopes or inclines should be long enough, properly alined, and kept in good repair (6).

16. Two independent methods of signaling in shafts are recommended (15).

17. The signal code in use at the mine should be posted prominently in the engine room, in easy sight of the hoisting engineer, and at all places where signals are given.

8. Cages and Shafts

1. Cages used for hoisting men should be of substantial construction, kept in good repair, and provided with (16):

(a) Adequate steel bonnets;

*(b) End protection;

(c) Handholds; and

(d) Bridle chains.

2. Safety catches that act quickly and effectively in an emergency should be provided. They should be tested at least monthly, or oftener if required by State mining laws. Written records should be kept of all tests.

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3. Cages and guides should be inspected daily and a record made of such inspections (6).

4. Openings in a cage floor should be covered when men are being hoisted.

*5. There should be a cager at the top (topman) and bottom of the shaft (footman) when men are being hoisted or lowered (17).

*6. Top and intermediate landings in shafts should be equipped with safety gates (13).

*7. Tools or other materials should not be carried in the cage with men. This does not apply to equipment and repair material requiring attendants.

8. The speed of the cage when hoisting or lowering men should be as specified by State law (18).

9. Steam Plant

1. Boilers should not be located less than 100 feet from any mine opening, coal breaker, or other structure in which persons are employed in the preparation of coal. (19).

2. All boilers used for generating steam in and about mines and collieries should be kept in good order and examined and inspected by a qualified person as often as once in 6 months, and oftener if necessary. The result of such examination should be certified in writing to the State inspector for the district within 30 days thereafter (20).

3. Each nest of boilers should be provided with a safety valve of sufficient area for the steam to escape and with weights or springs properly adjusted (20).

4. Every boilerhouse should be provided with a steam gage, properly connected with the boilers, to indicate the steam pressure, and another steam gage should be attached to the steam pipe in the enginehouse and placed in such position that the engineer or fireman can readily examine them to see what pressure is carried. Such steam gages should be kept in good order, tested and adjusted as often as once every 6 months, and their condition reported to the State inspector in the same manner as boiler inspections are reported (20).

5. At least two safe, easily accessible means of exit from all parts of the boiler room should be provided.

6. A stairway or fixed ladder should be provided to give safe access to the top of the boilers or runways between boilers.

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7. Compressors should be equipped with a fusible plug that will open at 50° F. less than the flash point of the lubricating oil in use. This plug should be placed in the main discharge line as near the compressor as possible.

8. The main compressor air receiver should be equipped with safety or relief valves as well as valves to drain off accumulated water.

10. Surface Electrical Material

1. Overhead transmission lines should be placed at least 15 feet above the ground and 20 feet above driveways, and should be supported adequately and guarded where necessary to prevent contact with other circuits.

2. High-potential power lines should be protected adequately by circuit breakers.

3. The wires of all electrical circuits should be of ample capacity.

4. Trolley wires should not be less than 6-1/2 feet above the top of the rail.

5. Trolley wires should be taut and securely supported by enough insulated hangers to prevent sag.

6. Transformers that are not on poles and are within 15 feet of the ground should be enclosed in a transformer house or by a substantial fence at least 6 feet high.

*7. The gate or door to a transformer station or fence should be kept locked at all times, unless authorized persons are present.

8. DANGER-HIGH VOLTAGE signs should be placed on all transformer enclosures and high-potential switchboards.

9. Casings of all transformers should be adequately grounded. The size of the ground wire should be determined by the maximum voltage on the line.

10. Frames of all generators and motors and metalic casings of cables carrying more than 110 volts should be grounded.

11. Switchboards should:

(a) Have ample working space around and back and should be free of rubbish and stored material;

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(b) Have an entrance at each end to permit authorized persons to inspect, adjust, or repair apparatus back of the switchboard;

(c) Be adequately lighted;

(d) Have a control readily accessible for an emergency shut-down;

(e) Have a cut-out switch on the incoming circuit at or near the rear entrance; and

(f) Be kept locked to prevent unauthorized persons from gaining access. The type of lock used should permit the gate or door to be opened from the inside without a key.

12. Dry, wooden platforms or mats of rubber or other electrically nonconducting material should be maintained in front of all switchboards and at all electrical machinery where contact hazards exist.

13. Wires or other substitutes that do not provide adequate protection should not be used in place of approved fuses.

14. Guy wires from poles supporting wiring carrying high-potential current should be efficiently grounded, and insulated between the ground and poles near the poles.

15. Fire extinguishers approved for extinguishing electrical fires should be available at all electrical installations where a fire hazard exists.

11. Surface Explosives

The storage of explosives should conform to the present State mining laws on explosives and the regulations of the Federal Explosives Act.

1. Surface explosives-storage magazines:

(a) Should be constructed as provided in the Federal Explosives Act instructions;

(b) Should be barricaded and located to conform with the American Table of Distances;

(c) Should be situated a safe distance from waste dumps;

(d) Should have danger signs as required by the Federal Explosives Act. These signs should be so placed that a bullet shot through the sign will not hit the magazine;

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(e) Should be provided with properly screened ventilators; and

(f) Should be kept locked securely at all times when not in use. The type of lock to be used is described in the Federal Explosives Act instructions.

2. Lighting of surface magazines should be natural or by means of portable electric storage-battery lamps, or other protected electrical system, as approved by an authorized representative of the Bureau of Mines. (Federal Explosives Act.)

3. The area for at least 50 feet around the magazine should be kept free of dry grass and brush or other combustible material. Preferably, the ground around the magazine should be covered with cinders, gravel, or other material to prevent the growth of grass or weeds.

4. Detonators should be stored in a separate magazine not less than 100 feet (or 50 feet, if barricaded) from the explosives-storage magazine. The construction of the magazine should conform to the standards set by the Federal Explosives Act instructions.

5. No materials other than explosives should be stored in explosives-storage magazines.

6. No materials other than detonators should be stored in detonator-storage magazines.

7. Magazines for distributing explosives should be constructed in accordance with the standards of the Federal Explosives Act and situated a safe distance from the mine opening, highways, and buildings, in accordance with the American Table of Distances. Preferably, it should be surrounded by a substantial fence which has a locked gate.

8. Not more than 1 day's supply of explosives should be kept in the distributing magazine.

9. Unauthorized persons should not be permitted in the distributing magazine.

10. Only wooden or nonsparking plastic tools should be used for opening boxes of explosives.

11. Waste paper and used empty boxes should not be allowed to accumulate in storage, distributing, or detonator magazines.

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12. No open lights, nonpermissible flashlights, or smoking should be allowed in main or distributing magazines or while explosives or detonators are being handled.

13. When being moved, cases or kegs of explosives should always be lifted and set down carefully. They should never be slid over one another or dropped from any elevation.

14. Motor vehicles or other vehicles used in surface transportation of explosives should be strong, substantial, in good working order, and constructed preferably with a closed body having ends and sides sufficiently high to prevent containers of explosives from falling or rolling off. The steel box of the vehicle should be provided with false, wooden floors to prevent the explosives containers from coming in contact with the metal.

15. The battery and wiring on motor vehicles used in hauling explosives should be located so that they cannot come in contact with packages of explosives, and the wiring should be well insulated and fastened to prevent short circuits.

16. State mining laws or other regulations as to marking equipment transporting explosives should be obeyed. If no laws or regulations are in effect, such vehicle should be placarded on the front, each side, and rear with the word "EXPLOSIVES" in letters not less than 3 inches high, or it should display a red flag with the word "DANGER" on it in white letters not less than 6 inches high.

17. Unauthorized persons should not be permitted to ride on equipment transporting explosives, and the driver and attendants should not be permitted to smoke or carry matches or lighters.

18. Trucks or other vehicles containing explosives should never be left without first stopping the motor and setting the brakes securely, and should never be taken into a garage or repair shop.

19. Explosives transported in the truck should never be left unattended until they are placed in a magazine and the magazine is locked, or until they are delivered to some person authorized to receive them.

20. The motor of a truck containing explosivies should be stopped before unloading is begun and the packages should never be left immediately in back of the exhaust, as a spark may start a fire and cause an explosion.

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21. Explosives should not be issued by company stores or other stores to wives or children of miners, or carried or otherwise handled by women or children.

22. Explosives should not be stored, even temporarily, in merchandising stores, in or near miners' homes, in hoist rooms, or in other surface structures.

UNDERGROUND

12. General Practice

1. Air courses should be traveled at least once each week by a certified mine official, who should leave his initials and the date; air courses that might be used as an escapeway in case of emergency should be inspected and defective conditions remedied promptly (21).

2. All underground entrances to any places not in actual course of working or extension should be properly fenced across the whole width of such entrances to prevent persons from inadvertently entering them (22).

*3. Statements of all dangerous conditions should be reported daily in a book signed and dated by the mine foreman. This record should conform to the State mining law (23).

4. Each working place should be inspected for safety by a certified official at least twice each working shift and while the men are at work, or at such more frequent periods as seem necessary and practicable.

5. Special company rules regarding mine safety should not be adopted and published unless approved by the authorized State agency.

6. New employees should be fully instructed regarding the particular hazards incident to their work; this applies to both experienced and inexperienced personnel. It is recommended that all employees familiarize themselves with the State mining laws.

7. A mine map should be available that accurately shows the thickness of the existing barrier pillars and the boundaries of the property, as provided by the State mining laws (24).

8. Mine workings approaching abandoned workings that cannot be inspected, or workings filled with water or gas, or fire areas or suspected fire areas in which the atmosphere is unknown, should have boreholes in

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advance of the face and enough flank boreholes on each side to conform to the State mining laws (25).

9. Openings should not be made into known or suspected fire areas in which conditions are unknown, except under the direction and constant supervision of a certified mine official, and then only after all precautions have been taken to prevent the admission of air until conditions are known to be safe and the procedure followed does not expose the workmen to dangers from explosions, fire gases, or hot materials, and the State mine inspector should be notified (26).

10. Loading-machine operators should not be permitted to allow unauthorized persons to be near their machines while in operation.

11. It is recommended that consideration be given, by both the management and the workmen, to the wearing of protective clothing.

12. Haulagemen and others who work around machinery should wear snug-fitting clothing.

*13. The foreman and other persons in charge of underground operations and all assistant foremen should have Certificates of Competency from the State, as required by law (27).

14. Idle or abandoned sections of the mine should be inspected for gas and other dangerous conditions by the foreman or assistant foreman immediately before employees are permitted to enter these sections, to assure the safety of the workmen.

15. Every underground mine should have not less than two openings or outlets separated by strata not less than 60 feet in breadth underground and 150 feet in breadth at the surface that are in connection with every seam of coal and connected from every lift and level thereof worked in such a mine; except that it is not necessary that two openings belong to the same mine if the persons employed therein have safe, ready, and available means of ingress and egress by not less than two openings. This statement, however, does not apply to opening a new mine or to opening any new lift of a mine being worked, for the purpose of making communication between two outlets, so long as not more than 20 persons are employed at any one time in such a mine or new lift of a mine; neither should it apply to any mine or part of a mine in which the second outlet has been rendered unavailable by reason of the final robbing of pillars previous to abandonment, so long as not more than 20 persons are employed therein at any one time. The cage or cages and other means of egress should at all times be availabe for the persons employed where there is no second outlet (28).

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16. Escapeways should be readily accessible from every section of the mine and should be kept in a safe condition, reasonably free from steam, dangerous gases, standing water, ice, and other obstructions (28, 29).

17. Escapeways should be of sufficient heighth and width to allow men to travel safely (29).

18. Direction signs should be posted conspicuously to indicate manways and escapeways.

19. Where the escapeways are shafts:

(a) They should be equipped with an independent hoist and cage;

(b) If shafts are not more than 30 feet deep, a stairway should be used; and

(c) Stairways should be kept in good repair, with landings free of debris.

20. All mine openings used as escapeways should be guarded from fire hazards near their entrances.

21. All surface openings to underground workings that are not necessary for the operation of the mine or for escape, and are not adequately ventilated, timbered, and regularly inspected, should be kept securely closed to prevent unauthorized persons from entering the mine and also to keep surface fires from extending underground. They should be located in such a way as not to prevent the escape of employees in an emergency.

22. All openings necessary for operation or escape should be guarded against the entrance of unauthorized persons.

23. A check-in-and-out system should be provided. Identification checks should be provided that will positively identify each person entering the mine. The daily record in connection with the system should be kept in a place that will not be affected by an explosion of the mine.

24. Barrier pillars should be left when workings are adjacent to old workings suspected of containing water, bodies of dangerous gas, or fire. If the danger is from water or fire, the barrier pillar should be of such width as may be determined by the engineers of the adjoining property owners and the State Mine Inspector of the district in which the mine is situated (30).

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*25. (a) Machinery should not be repaired while it is in motion (31).

(b) Machinery should not be oiled while it is in motion, except where such oiling can be done without danger to the oiler (31).

26. A guard or safety device removed from any machine should be replaced before the machine is again put in operation (5).

27. Movement of cutting machines or mobile loaders should be properly supervised.

28. Mining machines should not be loaded on trucks or moved unless they are equipped with a safety chain or other adequate locking device.

29. Permissible electric cap lamps should be carried by all underground employees; and, in addition, safety-lamp protection should be as provided by the State mining laws.

30. Excessive amounts of each kind of lubricating oil and grease should not be stored at any one place in the mine at any time.

31. Underground storage places for lubricating oil and grease should be of fireproof or fire-resistant construction. Lubricating oil and grease in face regions or other working locations should be enclosed in metal containers.

32. All buildings inside of any anthracite mine, including engine houses, pump houses, stables, transformer stations, substations, and shanties, should be constructed of incombustible material (32).

33. Hay or straw should be stored in a fire-resistant structure apart from the stable.

34. Underground stables should be ventilated by separate splits of air with vents to a return air course.

35. A separate run-around or passageway should be provided for travel near the foot of shafts and intermediate shaft landings.

36. The operator of a caterpillar machine, when moving from place to place, should ride on the step provided for that purpose to prevent injury from sideslip of caterpillars from the rail.

37. Self-closing barrier gates should be provided on manways where they cross main haulageways.

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*38. Drilling in rock work with percussion drills should be done wet. Men drilling rock with auger-type drills should wear approved-type respirators if dust is created.

39. Welding underground should be done in pure intake air.

13. Ventilation

1. Mine fans should be:

(a) Installed on the surface when feasible;

*(b) Installed in a fireproof house;

*(c) Offset at least 25 feet from the line of any opening;

(d) Provided with ample pressure-relief or "explosion" doors;

*(e) Installed to permit prompt reversal of the mine-air currents.

*(f) Provided with at least two independent sources of power immediately applicable;

(g) Operated continuously in gassy mines;

(h) Provided with a recording instrument for recording the ventilating pressure (33); and

(i) Provided with a device to give alarm when the fan slows down or stops.

2. Ventilating fans at isolated locations should be:

(a) Inspected daily; and

(b) Attended constantly at gassy mines if not provided with an automatic warning signal and with remote control.

3. The area around fans, especially in isolated places, should be kept free of dry grass or brush or other combustible material.

4. Ventilating fans should be located so the return air from the mine cannot be pulled into the intake-air openings.

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*5. An auxiliary fan, preferably operated by an internal-combustion or steam engine, should be provided on the surface when feasible, to serve in event of the failure of the main fan.

*6. A mine should be classed as gassy when methane or other combustible gas can be detected in amounts of as much as 0.25 percent or more by frequent systematic search.

*7. Booster fans should not be used underground if recirculation of air is possible.

*8. Auxiliary fans or blowers with tubing (preferably on suction) may be used to ventilate faces of rock tunnels being driven between two coal beds or through faults and wants and certain other sections, provided they are installed in strictly pure intake air or are powered with permissible driving units and so located that recirculation of air is impossible; before an auxiliary or blower fan is installed the installation should be approved by the State mine inspector.

*9. Air in working places or passageways used for traveling should contain at least 20 percent of oxygen, not more than 0.5 percent of carbon dioxide, and no harmful amount of dust or poisonous gas (carbon monoxide, oxides of nitrogen, hydrogen sulfide, sulfur dioxide), except when the mine has been exempt by order of the Secretary of Mines (in Pennsylvania) and the conditions on which the exemption was granted are met.

*10. If the air of a working place contains more than 1 percent of inflammable gas, the place should be considered hazardous and the ventilation should be improved immediately; if it contains more than 1-1/2 percent (slightly less than 1/2-inch cap on a testing or low flame), the workers should be withdrawn until ventilation has been improved.

*11. If the air returning from a split that ventilates any group of active workings contains more than 1/2 percent of inflammable gas as determined by chemical analysis in duplicate or by other recognized means of accurate detection, the workings of that split should be considered hazardous and require improved ventilation. If this air contains more than 1-1/2 percent of inflammable gas the workers should be withdrawn until ventilation has been improved.

*12. The quantity of pure air, in cubic feet per minute, in any split circulated through the last open crosscut should not be less than 200 times the number of men working in the split of air, and as much more as may be required to maintain safe conditions (34).

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*13. The quantity of air reaching the last open crosscut of any pair of gangways or entries or airways, or the maximum inby point of a split, should be at least 6,000 cubic feet per minute.

*14. The quantity of air reaching the face of each working place should be at least 200 cubic feet per minute per man employed, and as much more as may be necessary to dilute and carry away any inflammable or harmful gases that may be present (35).

*15. All gangways, entries, rooms, chambers, breasts, chutes, or sections that cannot be kept well-ventilated throughout and regularly inspected, or that are not being used for coursing the air, travel, haulage, or the extraction of coal should be sealed by strong, fireproof stoppings and provided with some means of bleeding off the gas into the return (36).

*16. Ventilation should not be shifted from inaccessible, idle, or abandoned sections to active sections to provide an adequate quantity of air for different working shifts unless the quality of the air is known to be safe (34, 37).

17. Crosscuts or pillar headings or cross headings should be spaced not more than 60 feet apart, and the face of each chamber or breast should not be advanced more than 60 feet beyond the nearest cross heading (38).

*18. Stoppings between intake and return airways should be constructed of substantial incombustible material, except that one temporary stopping of wood may be erected between the last permanent stopping and the face of gangways or entries. These stoppings should be completed promptly as the passageways are advanced (39).

19. Stoppings in rooms, chambers, breasts, or chutes should be of gob wall, dirt, or tight board, preferably gunited or plastered (39).

20. Canvas of fire-resistant material may be used from the last open crosscut in connection with line brattice, using boards at the top and the bottom of the brattice (39).

21. Permanent stoppings should be erected in the crosscuts or headings between every fifth and sixth chamber or breast (39).

*22. A split ventilation system, utilizing air crossings, should be used for conducting ventilation in all passageways where feasible (40).

23. All main doors should have an attendant whose constant duty it should be to open them for transportation and travel and prevent them

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from standing open longer than is necessary for persons or cars to pass through, unless a self-acting door is used that is approved by the State mine inspector of the district (42).

24. Where main doors are used in connection with coursing the air in any one split they should be (41):

(a) Provided in sufficient number to form air locks (42);

(b) Self-closing (43);

(c) Provided with a supply of rock dust or a chemical fire extinguisher on each side for fire-emergency use if the doors are of wood;

(d) Hung so that they swing to the clearance side; and

(e) Hung so as to open against the ventilating current; and

(f) An extra main door should be so placed and kept standing open as to be out of reach of accident, and so fixed that it can be closed at once if necessary (44).

25. All permanent air bridges should be tight and of noncombustible material and should be so arranged as to pass the required quantity of air (45).

26. Trap doors placed in stoppings should be so hinged or constructed as to be self-closing, tight, and open against the air current.

27. The space on both sides of line brattice should be large enough to permit free flow of air (34).

28. Rooms, chambers, breasts, or chutes should not be worked off an entry, heading, or gangway in advance of the last break-through or chute, even if line brattices are utilized.

29. Places should not be worked on an air current that has passed through abandoned workings, unless the quality of such air is known to be safe and the air movement can be controlled (33).

30. Airways should be kept clear to permit free passage of air; this includes nonhaulage air courses as well as those utilized for haulage or manways (46).

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31. Changes in ventilation affecting the mine as a whole or splits thereof should be made when the mine is idle and with no men in the mine other than those engaged in changing the ventilation (47).

32. Should the main fan at a gassy mine fail or stop for a period determined critical by the State department or an obviously dangerous condition is imminent, the men should be withdrawn from the mine immediately. After the fan has been started, the mine should be examined thoroughly for gas, and any gas found should be removed before the men reenter. The same procedure should be followed in the section of a gassy mine if it is ventilated by a booster fan, which has stopped longer than momentarily (47).

33. Should the main fan of a nongassy mine fail or stop for a period determined as critical by the State department, the men should be withdrawn from the mine immediately. After the fan has been started, the mine should be examined thoroughly for an dangerous conditions that could result because of stoppage of the fan, and such dangerous conditions should be removed before men reenter the mine.

34. If stoppage of the mine fan at a gassy mine is more than momentary, mine electrical power should be cut off from face sections; and if stoppage is for the duration of the critical period determined by the State department, power should be cut off from the entire mine, with the exception of the installations necessary for safe removal of the men and operation of pumping plants, hoists, etc. A thorough examination for gas should be made before the power is restored.

*35. Permissible methane detectors should be used when making inspections for explosive gas. Permissible flame safety lamps are considered a type of permissible methane detector.

36. When not in service, all methane indicators or detectors and flame safety lamps should be placed in the custody of a competent person responsible for their maintenance and testing (3).

37. All persons required to use methane-indicating devices or flame safety lamps should be thoroughly instructed in their use and limitations.

38. Enough assistant foremen should be employed in gassy mines to:

*(a) Begin examination of a mine not more than 3 hours before each shift enters the mine (23);

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(b) Examine every working place, all places adjacent to live workings, every roadway and manway, every unfinished road to abandoned workings, and all accessible sources in the mine for explosive gas and other hazards (23).

(c) Leave at or very close to the face of each place examined the initials of the fire boss or other authorized person and the date (21);

(d) Place a danger signal across the entrances to every place where explosive gas can be detected in dangerous amounts by a flame safety lamp, or in any other place that might affect the safety of the men in that section (48);

(e) Report to the foreman any dangerous conditions found before the men enter the mine (47);

(f) Record the results of their inspections in a book kept on the surface for that purpose (23); and

(g) Indicate on the bulletin board near the mine entrance, or other location authorized by the State mining laws, the places where gas is found or other dangerous conditions are observed (48).

*39. Electrically driven permissible equipment should not be taken into or operated in any place if methane can be found by a flame safety lamp or other permissible methane detector in amounts greater than 1 percent in the general air of the place. The methane content in the general air under such conditions should preferably be kept below 0.5 percent, as determined by analysis. Such tests for methane should not be made nearer than 4 feet from the face and 10 inches from the roof.

40. Electrically driven permissible equipment operating in face regions in a gassy mine should not run more than 30 minutes without an examination for gas; in very gassy places or those in disturbed strata, such as during a squeeze, examinations for gas should be made at intervals of not more than 15 minutes.

41. Electrically driven permissible equipment should be examined each shift by a competent person and a record kept. This record should note the defects found and the steps that were taken to maintain the permissibility of the equipment.

42. Haulage and hoisting openings and main haulageways should be kept on intake air.

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43. In every sealed area one or more stoppings should be fitted with a pipe and valve to allow sampling of the atmosphere behind the seals. Excess pressure should be relieved through pipes leading into a return airway, or this relief may be obtained by means of boreholes to the surface.

44. The mine foreman should daily read and countersign the reports of the assistant foreman (23).

45. Air should be measured by the mine foreman, his assistants, or other certified official at least once each week at or near the mouth of the main inlet and outlet airways and also in or immediately adjacent to the last crosscut on each air split, at or near the face of each entry or gangway, and at the nearest crosscut or cross heading to the face of the inside and outside chamber, breast, or chute where men are employed. Tests should be made with flame safety lamps or other methane indicators in such splits and in the main return. A record of these measurements and tests should be kept in a book furnished for this purpose (38).

*46. Smoking is an explosion hazard in a gassy mine; is a fire hazard as well as a dangerous practice if done while handling explosives, and for these reasons it should not be permitted in any mine.

47. Employees in gassy mines should be searched frequently for smoking materials, matches, and other lighting devices in a manner to assure that such articles are not being carried into the mine (49).

48. Accumulated gas should be removed under the direct supervision of a foreman or other person authorized by the State mining laws, and men should not work, or nonpermissible electrical equipment be operated, in the return air from such a working place or section while gas is being removed (47).

*49. When electric power has been off in a gassy mine or section for the period determined critical by the State mine inspector for the district, the mine or section should be examined for gas with a permissible flame safety lamp; and if gas is detected, the power should not be turned on again until the gas has been removed; also, any gassy section should be examined before electrical equipment is put into operation, regardless of the time elapsed following the cut-off of power. However, this is not intended to bar operation of units such as pumps or properly fused branch lines if the surroundings have been examined and no gas has been found with a flame safety lamp.

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14. Explosives and Blasting Devices

The regulations and instructions of the Federal Explosives Act governing the handling or storage of explosives in mines should be used in connection with all matter that come under the terms of the act.

1. Receptacles or boxes used to carry explosives into mines should be closed and be constructed substantially of nonconducting material.

2. Bodies of cars used for transporting explosives underground should be designed for that purpose and constructed substantially of nonconducting material and should be fully insulated, including the couplings.

*3. The supply of explosives should be delivered on the off shift or between shifts, where that is feasible.

4. Explosives should not be carried on the same trip with workmen.

5. Trips carrying explosives should not be run at the same time man trips are operated.

*6. It is recommended that explosives and detonators be transported, and kept in separate containers.

*7. Explosives and detonators for use in work should be stored in individual containers and kept not less than 15 feet apart in protected quarters situated at a safe distance back from the working place; not more than 1 day's supply should be stored in such places. In pillar (tumbling) or stump work, the foreman should designate safe places where explosives may be stored. The storage boxes should conform in construction to the box-type magazines specified in the Regulations under the Federal Explosives Act.

8. Underground storage boxes or magazines should be:

(a) Placed in a crosscut (heading) or abandoned chamber or breast neck as far away from the roadway as to be safe at least 25 feet from trolley or power wires, in a comparatively dry place, and at least 10 feet from the tracks in all instances where room is available at such a distance (50);

(b) Kept locked at all times, except when explosives supplies are being stored or removed;

(c) Protected from falls of roof; and

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(d) Constructed substantially (box-type magazine) and (if of metal) with electrically nonconducting lining.

*9. Not more than 24 hours' supply of explosives or detonators should be stored underground, unless stored as provided in the Federal Explosives Act. To avoid deterioration of explosives, the older explosives should be used first, so that none of the explosives in storage will be in the mine more than 24 hours before being fired (51).

*10. It is recommended that only permissible explosives and permissible blasting devices be used for blasting coal. In anthracite mines permissible explosives are recommended, owing to their greater factor of safety as compared with other explosives used in blasting coal in any mine or blasting rock in gassy mines.

11. Grounded electrical circuits should not be used for blasting from power circuits.

12. Shots should be charged and fired only by authorized persons (52).

*13. If the coal is cut, boreholes should not be drilled until after the undercut, top cut, or shear has been made.

14. Boreholes should be cleaned properly before a charge is placed in them.

15. Explosives should not be brought to the face while any electrical equipment is in operation at or near the face or if any power is on such equipment.

16. It is recommended that primers be made up at or near the face or at a location approved by the State department, immediately before loading and in a place removed from pipes, wiring, metal ventilating tubing, rails, or any other metallic materials that may become electrically energized.

17. All holes should be tamped with stemming or tamping bags to the mouth (collar); stemming can be construed to mean any type of plug used in lieu of stemming when its use does not create a harmful amount of noxious gases or permit a blown-out shot, and provided that the use of such plugs is approved by the State department.

18. Only wooden tamping bars should be used.

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19. Leg wires of electric blasting caps should be kept shunted until ready for connection to the firing cable.

20. A blasting cable should be:

(a) At least 200 feet long;

(b) Both firing lines should be broken at a safe distance from the face and kept shunted at the firing end until ready to be attached to the blasting unit or otherwise protected from stray currents or other possible electrically energized agencies;

(c) Coiled up after each shot or adequately supported on insulators; and

(d) Kept away from track, power lines, pipe lines, or other sources of electrical energy or stray currents.

21. Bare spots on the blasting cable should be insulated properly as soon as observed.

*22. The length of the ends of a blasting cable attached to the leg wires of detonators should be staggered to prevent short-circuiting.

23. Firing devices other than permissible types may be used in rock tunnels or rock crosscuts and rock chutes if a hazardous amount of methane is not present (53).

*24. A shot should not be fired when more than 1 percent of methane is known to be present (53).

25. Before commencing work, and also after the firing of every blast, the miner working a breast (chamber) or any other place in a mine should enter such breast (chamber) or place to examine and ascertain its condition, and his laborer or assistant should not go to the face of such breast (chamber) or place until the miner has examined the same and found it to be safe (54).

26. Shots should be fired promptly after charging.

27. Delay detonators may be used in anthracite mines under conditions that may be approved by the State department.

28. Examination for gas should be made before and after firing shots in a gassy mine, and the place should be examined for fire after blasting in every mine (53, 54).

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*29. Misfires should be handled under the supervision of the mine foreman or his assistant.

*30. Misfires due to defective detonators or defective leg wires within the hole should be handled by carefully washing any stemming out of the hole with a hose and inserting a new primer, or by firing a separate shot at least 2 feet away from and parallel to the misfire, or in any other safe manner that may be approved by the State department. If a separate shot is fired, careful search should be made to recover the unexploded explosives and detonator.

31. Adobe or other open, unconfined shots may be fired to start running of coal in chutes, but only if it is not possible to start the coal running otherwise and when no gas or fire hazard is present. Only permissible explosives should be used in such shots.

32. An accurate record should be kept of:

(a) The amount of explosives and detonators taken into the mine, as well as the amount not used during the 24-hour day;

(b) The number of misfired shots;

(c) The number of blown-out shots;

(d) The number of burned holes; and

(e) The total number of shots fired.

33. The kerf should be reasonably free of machine cuttings and excess water before shooting.

15. Electricity Underground

*1. Air in which nonpermissible mining equipment and electrical wiring are used should not contain more than 1/2 percent of methane, as determined by analysis or other recognized means of accurate detection of methane. In addition, such equipment and wiring should not be used in air from areas that might liberate dangerous explosive gas; also, if analysis or methane indicator (flame safety lamps or electrical indicators) shows methane in excess of 1-1/2 percent in holes in the roof of any working place, nonpermissible electrical equipment should not be taken into or operated in the working place until the pocket of gas has been removed by additional ventilation.

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2. Permissible equipment should be maintained in permissible condition, as determined by rigid examination daily in gassy sections and each week in nongassy locations by a person well-informed in the safe use of electricity underground and in the maintenance of permissible equipment; a record should be kept of such examainations; this record should show the defects found and how they are remedied. Repairs should not be made or the electrical parts opened at or near the face or in other than pure intake air while the power is on the machine or cable.

3. All electrical appliances, machines, and conductors should be of sufficient capacity for any work they may be called upon to do.

4. The metallic covering and armor of cables should be continuous electrically and grounded effectively.

5. All metallic frames, casings, and coverings of motors, generators, transformers, and other stationary equipment that can become energized through failure of installation or otherwise should be grounded permanently and effectively.

*6. Where a grounded electrical circuit is used, all underground metallic pipe lines and all metallic pipe lines leading outside the mine should be bonded to the return conductor at the end of metallic-pipe systems and also at intervals not exceeding 500 feet.

*7. All metallic pipe lines and conduits in shafts or boreholes should be grounded permanently at the top and bottom of the shaft or borehole.

*8. The frames of drills and other electrically driven tools intended to be held in the hands while being operated should be grounded.

9. No potential higher than 250 volts should be used for operating drills or any other electrically driven tool intended to be held in the hands. Such equipment should have the switch so constructed as to shut off the current when the hands release it.

*10. Underground electrical stations should be in rooms of fireproof construction or of fire-resistant construction if the installation is approved by the State mine inspector. Fire doors should be provided and so arranged as to close automatically in case of fire. Electrical stations include transformer installations, pumps, motor-generator stations, and storage battery-charging stations.

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*11. Underground stations having transformers filled with inflammable oil should be provided with a doorsill, or its equivalent, that will confine the oil to the room in case of leakage.

*12. Clean, dry sand or rock dust and fire extinguishers suitable from both a toxic and shock standpoint should be provided and placed outside of underground electrical stations so as to be out of the smoke of a fire inside the station.

*13. Underground storage-battery charging stations preferably should be placed on a separate air split.

14. Insulated mats or platforms should be used in front of all switchboards and starting switches of all permanent underground electrical equipment.

15. Trolley and bare power wires should be:

(a) Securely supported on insulated hangers;

(b) Kept taut and not permitted to touch the roof, rib, timber, or door frame;

(c) Preferably located on the opposite side from breasts chambers or chutes, refuge holes, and clearance side. If this procedure is impracticable, the trolley or power wires should be safely guarded in a manner approved by the State mine inspector;

(d) Sectionalized by proper switches at safe intervals, and switches should be placed near the beginning of all branch lines;

(e) Provided with sectionalizing switches at points where loaded mine cars are stored on idle days;

(f) Adequately guarded where the wire is less than 6-1/2 feet above the top of the rail, where men must pass under it;

(g) Adequately guarded and sectionalized at man-trip stations; and

(h) Cut off and fastened with an insulated turnbuckle at the inby end of the power line.

16. Power should be disconnected when repair work is being done on electrical equipment and accessories such as trailing cables, feed wires, trolley wires, switches, and junction boxes.

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17. Power lines should be properly guarded on both sides of all doors for a safe distance.

18. Power wires other than trolley wires should be properly insulated when passing through doors or stoppings; trolley wires should be protected from contact with doors or door frames.

19. Power wires, whether bare or insulated, should be supported on or by well-designed and installed insulators and not by nailing them on timbers.

20. Power should be cut off idle sections of a mine and cut off from the mine itself on idle days when feasible. This statement is not, however, intended to bar the use of properly fused branch lines for the operation of single units such as pumps, if the pump surroundings are examined with a flame safety lamp and found to be free of gas before energizing the branch line.

21. All underground electrical equipment should be provided with properly installed switches of safe design and construction.

22. All officials, haulage crews, electricians, and others connected with electrical maintenance should be instructed as to the location of cut-out switches.

23. All cut-out switches should be marked legibly so as to be found readily in case of emergency.

24. Enough circuit breakers should be provided to protect all power circuits. If they are automatic they should be set so that the circuits cannot be over loaded; if they are hand-set the handles should not be tied in place.

25. All underground electrical equipment should be protected against excessive overload by fuses or equivalent protective devices of the correct type and capacity.

26. Wiring in underground structures should be insulated and installed properly.

27. Telephone connections should be provided from the surface to all workings sections of the mine and should be kept available for service.

28. Telephone wires should be installed opposite power or trolley wires.

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29. Telephone wires crossing power or trolley wires should be adequately insulated.

30. Telephones should have suitable fuses or be otherwise protected.

31. If the track is used for the return circuit both rails should be well bonded at every joint and adequately cross-bonded.

32. Signal wires should not carry more than 24 volts.

33. Signal wires should be supported to prevent sagging or short circuits by contact or otherwise.

*34. In gassy mines, permissible junction or distribution boxes should be used in making power connections at working faces.

*35. Cables for portable or semiportable underground electrical equipment should be provided with nips or taps equipped with fuses of the correct capacity, unless suitably arranged for connecting to permissible junction or distribution boxes.

*36. Temporary cable splicing should be done in a workmanlike manner, electrically continuous, mechanically strong, and insulated. If a cable is defective, it is preferable to use a standby cable and send the defective cable to the shop for repair.

37. Permanent cable splicing should be done in repair shops by proper splicing and vulcanizing.

38. The trailing cable of power equipment should be suspended in long loops to prevent excessive heating. Trailing cables should not be coiled tightly.

39. Instructions in artificial respiration should be posted in every electrical station and at or near the entrance to the mine.

40. All employees working with or around electrical equipment should be trained to give artificial respiration.

41. A plan or map should be kept showing the location of all stationary electrical equipment and permanent wiring.

*42. Incandescent lamps on the slope or shaft bottom should be on a circuit separate from the trolley circuit.

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43. Lighting circuits should be fused safely.

*44. Lighting wires should be supported by suitable insulators connected to the trolley or power line with clamps, and should not be wrapped or tied about the stem or stud of trolley hangers.

45. The ground connection for lighting wires taken off the trolley circuit should be made to the track circuit.

46. Incandescent lamps should be so placed that they cannot come in contact with combustible material, particularly timber, such as caps, posts, collars, legs, props, lagging, or lumber.

*47. Incandescent lamps should not be used at or near any working face or other section where a gas hazard could exist, unless they are of the portable, permissible storage-battery type.

48. Lamp sockets with exposed metal parts should not be used underground.

16. Haulage

1. Haulage roads should be kept clean of spilled coal, coal dust, and debris.

2. Rails of tracks should be joined with fishplates (angle bars) or welded, and the track should be well supported by ties.

3. The roadbed should be kept well drained and surfaced.

4. Frogs, guardrails, and lead rails should be well blocked.

*5. Switches should be complete with parallel throws.

6. The rod extending from the rail to the switch throw should be covered so as not to be a stumbling hazard.

7. Switch throws should be placed on the clearance side.

8. Incandescent lamps should not be used to illuminate switches except where, State mining laws permit the use of open-type electrical equipment.

9. Internal-combustion engines should not be used underground unless a permissible type is made available or unless ventilation

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provisions are made acceptable to the State department and also to the Bureau of Mines.

10. Steam locomotives should not be used underground.

*11. A block or telephone-signal system should be used to control the movement of locomotives when two or more trains are operated on the same track.

*12. Pushing of cars should be eliminated insofar as possible; trips should not be pushed on main haulageways except at partings or in an emergency.

13. Sprags, chains, or car blocks should be used on all standing cars regardless of the grade of the track. If the cars have brakes, they should also be set (55).

14. The use of chips or small pieces of wood, pieces of coal or rock should not be considered as adequate blocking (55).

15. An effective drag or equivalent positive mechanical device should be used on all trips ascending steep grades (55).

16. A positive-acting safety block should be placed at or near the knuckle on all inside slopes and planes having a knuckle (55).

17. A positive stopblock or derail should be placed below the switch of the first active working place on all producing entries going to the rise (55).

18. A positive stopblock or derail should be placed on the head of each chamber going to the dip.

19. A positive stopblock or derail should be placed on the tracks leading to intermediate shaft landings (55).

20. When cars are being loaded in a chamber (breast), gangway (entry), or any other loading point, a head block should be placed against the car being loaded and another in front of the empty car or trip standing behind.

21. Slides or skids should be used on steep descending grades where cars are handled by locomotives.

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22. Each locomotive should have an efficient headlight and gong or other effective signaling device (56).

23. Locomotive headlight bulbs should not be supported by waste or other combustible material (56).

24. An efficient trip light should be placed on the rear of all trips and on the front of cars being pushed. Permissible-type trip lights should be used in gassy mines. Reflector buttons should not be substituted for trip lights (56).

25. There should be a clearance of at least 24 inches from the nearest obstruction to the farthest projection of moving equipment on the trolley-wire side of the gangway.

26. Sidetracks should have a clearance of at least 24 inches between the farthest projection of equipment on any two tracks.

27. Shelter holes should be available along all haulageways and they should be suitably marked (57).

28. Shelter holes should be kept clean and free from loose material and other obstructions (57).

29. Chamber, breast, or chute necks, and crosscuts or breakthroughs, if on the clearance side, should be considered as shelter holes (57).

30. Shelter holes should be made at all switch throws where sufficient clearance is not available.

31. Shelter holes or sufficient space for protection against the hazard from moving trips should be provided at all doors.

32. Clearance should not be obstructed by loose rock or coal, supplies, or other materials.

33. Only authorized persons should operate locomotives.

34. Locomotives and cars should be kept under control at all times.

35. A system of signals should govern the movement of trips.

36. Riding on locomotives should be prohibited, except to those operating the trip and persons authorized by the management.

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37. Riding on top of loaded cars, between cars, on the trolley-wire side of cars, or on the bumpers in front of cars should be prohibited. Riding on the outside of cars should be prohibited.

38. Motormen or brakemen should not get on or off cars or trips while in motion.

39. When a motorman leaves a locomotive temporarily the reverse lever of the control should be set at neutral and the brakes set tightly; if the lever is removable, it should be carried by the motorman.

40. Back-poling should be allowed only at places where the trolley pole cannot be reversed and the locomotive is operated at a very low speed.

41. Flying switches should be prohibited.

42. At least one car should be placed between the locomotive and cars or truck carrying rails or long timbers.

43. An interval of at least 500 feet should be maintained between locomotives traveling in the same direction.

44. Cars should not be coupled or uncoupled by hand while they are in motion, provided, however, that this should not apply to the top or bottom men of slopes, planes, or shafts.

45. Cars should not be coupled by hand from the inside of curves (56, 58, 59).

46. Locomotives approaching the passing through doors should be operated at reduced speed for at least 100 feet on each side of the door (56, 58, 59).

47. Locomotives should be equipped with suitable rerailers, jacks, and other necessary tools for rerailing cars or locomotives (56, 58, 59).

48. Short pieces of rail, ties, or props should not be used to slue derailed cars or locomotives, or for pushing cars or trains (56, 58, 59).

49. Cars and trips should not be left standing in a place where they will endanger other trips or persons (56, 58, 59).

50. Motormen, brakemen, and drivers should not leave ventilating doors and curtains standing open while placing or gathering cars (56, 58, 59).

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51. Cars and trips should not be left standing where they may obstruct the ventilating current.

*52. Man-trips should be in charge of an authorized person accompanying the trip.

53. The speed of man-trips should not exceed 6 miles an hour. Man-trips should be under the control of the motorman at all times (56).

54. Man-trips should not be operated behind loaded trips on ascending grades, or in front of loaded trips on descending grades (60).

55. Enough cars should be provided on man-trips to permit all men to ride inside the cars and thus prevent crowding (61).

56. Men on man-trips should not ride in the car next to a trolley locomotive (60).

57. When riding in a car on a trolley haulage road, men should ride on the side of the car opposite the trolley wire if there is any danger of coming in contact with the wire.

58. No person other than a brakeman should be permitted to ride on the rear bumper of a man-trip, and no person should be allowed to ride between cars (61).

59. The man-trip should come to a full stop before men are loaded or unloaded (60).

60. Suitable places should be provided at junction points where men may congregate while waiting for the man-trip; they should be located where lives of persons waiting will not be jeopardized by a run-away car or trip or the wrecking of a car or trip (60).

61. No material except tools and other supplies that will fit inside a separate car should be hauled on a man-trip; no explosive supplies should be carried on a man-trip (60).

62. Cars should be provided for the transportation of tools, which should not be carried in the same car with men on the man-trip (60).

63. At man-trip loading and unloading stations the power should be cut off the trolley wire while men are loading and unloading. The trolley wire should be adequately guarded at these stations (60).

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64. All employees who work around machinery and wear electric cap lamps should conceal the cables of their lamps under their clothing and should wear snug-fitting clothes.

65. Haulage equipment should be maintained in a safe condition.

66. Room hoists should not be worked beyond their capacity. Ropes used to rerail cars should be attached to the drawbar of the car.

17. Timbering

1. Timbering rules should be strictly enforced.

*2. An adequate supply of props, timbers, prepared cap pieces, and wedges or material necessary for same should be provided at places convenient to the working faces or other point of use.

3. Miners should examine their working places thoroughly and make them safe before beginning work (54).

4. Every underground worker should be instructed in the proper method of testing roof.

5. Exposed roof in every working face should be tested at frequent intervals when workers are at or near the face.

6. Mining-machine and loader operators should be provided with suitable roof-testing bars and should test the roof and sides, and any dangerous condition should be remedied before operation is begun. The machine should be stopped while the roof and sides are being tested.

7. Officials should examine exposed roof in working places visited.

8. Unsupported loose coal, slate, or rock in haulageways and manways should be removed or supported securely.

9. Before loose roof is taken down the adjacent roof should be carefully examined.

10. If loose slate or other loose material is being pried down, a bar should be used.

11. Where conditions make it impossible to set permanent timber, props should be stood before coal loading is begun.

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12. Props should be set not more than 5 feet apart and closer if necessary.

13. In slopes or inclined shafts and in main haulageways props supporting the roof or sides should be hitched into the rib or wall. If this is not practicable, substantial guardrails should be placed along the sides, or spacers should be placed between the posts.

14. Cap pieces should be large enough to cover the prop adequately.

15. Miners or other employees should not go under draw slate or other loose roof material until it has been made safe (62).

16. Timber knocked out by shooting should be replaced as soon as possible.

MISCELLANEOUS

18. Safety Organization

1. A safety organization should be established at each mine, and meetings should be held at least monthly.

2. A bulletin board and suitable bulletins should be provided, and the bulletins should be changed from time to time and kept interesting and up-to-date.

3. All accidents should be investigated and a record kept of such investigations.

4. Responsibility for accidents should be placed, when it is feasible to ascertain such responsibility.

5. A record should be kept of all lost-time accidents, and the record should be summarized periodically and studied with a view to making needed corrections in practice.

19. First Aid and Mine Rescue

1. All employees (underground and surface) should be given first-aid training, and when feasible additional training should be given annually.

2. Adequate first-aid material should be provided on the surface and underground and kept in a clean, usable condition.

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3. A selected number of men should be trained in mine rescue work at every mine. At least 12 men should be trained for any mine employing more than 100 men whenever such training facilities are available.

4. Additional mine-rescue training should be given monthly if training facilities are available.

5. Mine-rescue equipment should be provided if the mine does not have access to State-owned equipment or is not a member of a central rescue station.

6. If self-rescuers are available for use by employees, the employees should be instructed in their use. The self-rescuers should be tested at frequent intervals by immersion in hot water.

REFERENCES

The reference numbers refer to requirements in the Anthracite Mining Laws of Pennsylvania, as compiled by the State Department of Mines (1941, 156 pp.), and reference should be made to these sections of the anthracite mining laws:

1. Art. 4, sec. 5, p. 16.
2. Art. 6, sec. 1, pp. 23 and 24.
3. Art. 12, rule 9, pp. 50 and 51.
4. Art. 12, rule 23, p. 55.
5. Art. 5, sec. 5, pp. 22 and 23.
6. Art. 12, rule 13, p. 52.
7. Art. 12, rule 50, p. 62.
8. Art. 4, sec. 14, p. 19.
9. An Act, sec. 1, p. 94.
10. Art. 12, rule 18, p. 54.
11. Art. 4, sec. 13, pp. 18 and 19.
12. Art. 12, rule 42, p. 60.
13. Art. 4, sec. 15, p. 19.
14. Art. 4, sec. 12, p. 18.
15. Art. 4, sec. 9, p. 17.
16. Art. 4, sec. 10, pp. 17 and 18.
17. Art. 12, rule 40, p. 59.
18. Art. 12, rule 19, p. 54.
19. Art. 5, sec. 2, p. 21.
20. Art. 5, sec. 1, 3, and 4, pp. 21 and 22.
21. Art. 12, rules 4 and 6, pp. 49 and 50.
22. Art. 4, sec. 8, p. 17.

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23. Art. 12, rule 5, p. 49.
24. Art. 3, sec. 1, p. 8.
25. Art. 12, rule 15, p. 53.
26. Art. 14, sec. 2, rule 6, p. 54.
27. Art. 8, sec. 1, p. 26.
28. Art. 4, sec. 1, pp. 12 and 13.
29. Art. 4, sec. 3 and 4, p. 16.
30. Art. 3, sec. 10, p. 12.
31. Art. 5, sec. 8, p. 23.
32. An Act, sec. 1, p. 95.
33. Art. 10, sec. 17, p. 47.
34. Art. 10, sec. 4, p. 44.
35. Art. 10, sec. 3, p. 44.
36. Art. 10, sec. 5, p. 44.
37. Art. 10, sec. 1, p. 43.
38. Art. 10, sec. 15, p. 46.
39. Art. 10, sec. 8, p. 45.
40. Art. 10, sec. 6, p. 44.
41. Art. 10, sec. 11, p. 46.
42. Art. 10, sec. 10, p. 45.
43. Art. 10, sec. 9, p. 45.
44. Art. 10, sec. 12, p. 46.
45. Art. 10, sec. 14, p. 46.
46. Art. 10, Sec. 7, p. 45.
47. Art. 12, rule 8, p. 50.
48. Art. 12, rule 7, p. 50.
49. Art. 12, rule 10, p. 51.
50. Art. 12, rule 27, p. 56.
51. Art. 12, rule 26, p. 56.
52. Art. 12, rules 35 and 36, p. 58.
53. Art. 12, rule 11, p. 51.
54. Art. 12, rule 34, p. 58.
55. Art. 12, rule 50, p. 62.
56. Art. 12, rule 44, p. 60.
57. Art. 12, rule 43, p. 60.
58. Art. 12, rule 25, p. 55.
59. Art. 12, rule 46, p. 61.
60. Art. 12, rule 17, p. 53.
61. Art. 12, rule 16, p. 53.
62. Art. 12, rule 14, p. 52.

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